Preliminary Hot Spot Report
Enviro-Chem Superfund Site
Zionsville, Indiana

March 26, 1998

Versar Inc.

Introduction

This report presents the preliminary results of the hot spot treatment investigation at the Enviro-Chem Site located in Zionsville, Indiana. As part of this treatment investigation, five soil borings were advanced in the southwest corner of the Southern Concrete Pad Area; wells were installed in two of the borings; groundwater samples were collected for CLP analyses (full priority pollutant list) from the two wells; and a sample was collected for a pilot study for the recommended remediation (Fenton reagent/in-situ oxidation), see Versar's Hot Spot Work Plan dated 9 March.

This report focuses on only the geology of the hot spot area and the extent of the concentrated organics in relation to the geology. The information is presented graphically on Figures 1 and 2. A final report will be submitted once the results of the pilot test and the ground water sample analyses are received.

Background

During the advancement of the Southern Concrete Pad Geotechnical Survey's borings (G-1 through G-18) at the Enviro-Chem site, unexpected concentrated organics were encountered below six feet in soil borings G-17 and G-18. Based on these borings, the extent of the concentrated organics appeared to be limited and subsurface characteristics suggested that a Fenton reagent would be an appropriate method of treatment for the hot spots. Versar developed a work plan (dated March 1998) to address the hot spots.

Field Investigation

An initial soil exploration boring, designated as TB-1 (Test Boring -1), was advanced at the location shown on Figure 1. Originally, this boring was to be advanced in an uncontaminated area north of G-18, however, due to significant water and ice on the concrete pad at the time of drilling, the location was changed to a dry and uncontaminated area east of G-18 as shown on Figure 1. The purpose of this boring was to characterize the underlying stratigraphy proximate to the "hot spot."

In addition, based on the anticipated extent of concentrated organics in the hot spots (determined during the Southern Concrete Pad Geotechnical Survey), four boreholes were advanced in the area of the hot spot and were designated as IW-1 through IW-4 (Injection Well) at the locations shown on Figure 1. The purpose of these boreholes was to intercept the zone of concentrated organics (based on PID measurements and visual observations) and to install well screens in the appropriate interval to allow withdrawal of groundwater and subsequent injection of chemical oxidants for treatment purposes. Water bearing sand units with associated concentrated organics were encountered in boreholes IW-1 and IW-4 only. No significant water or concentrated organics were encountered in boreholes IW-2 and IW-3, and as a result, these two boreholes were grouted to the

surface in accordance to Indiana Department of Environmental Management (IDEM) guidelines. Four-inch diameter wells were installed in boreholes IW-1 and IW-4.

Prior to advancing the five boreholes, a 12-inch diameter casing was installed to a depth of six feet below the ground surface to prevent potential cross-contamination from the upper five feet of contaminated soils (identified by previous evaluations). Hollow stem auger drilling methodologies were utilized coupled with continuous split spoon sampling in each of drilling locations. All split-spoon samples were logged geologically and field screened for volatile organic vapors using an HNu Photo-Ionization Detector calibrated to an isobutylene standard. Four-inch diameter PVC casing and well screen (0.020 slot size) with a bottom cap were installed in boreholes IW-1 and IW-4. A sand pack was added to approximately one foot above the screened interval. A two-foot bentonite seal was placed on top of the sand pack, and the remaining annular space was grouted with a cement and bentonite slurry. The wells were completed with concrete base, protective casing, and locking caps. Drill cuttings were containerized in 55-gallon drums and stored on-site for subsequent incorporation into the SVE treatment area.

The two newly installed monitoring wells were developed utilizing air sparging equipment (30 to 40 pounds per square inch of pressure) and hand bailing. Well IW-1 was bailed dry and did not have any significant recovery over a period of five hours. However, after three days, the water level was approximately 10 feet below the ground surface. Well IW-4 was bailed dry (after approximately three well volumes had been removed). After two hours, the water level appeared to stabilize at 18.5 feet below the ground surface. Purge water was containerized in 55-gallon drums and stored on-site for subsequent treatment in the on-site WWT system prior to discharge.

During the boring program, attention was focused on the moisture content in each of the samples, the specific soil classification of the sample, the static water level in the borehole, any changes in water level, and evidence of concentrated organics. Drilling logs are presented in Appendix A (graphic logs and well construction details will be completed and provided in the final report).

Localized Geology

The stratigraphy underlying the hot spot is that of glacial deposition based on the erratic distribution of sediments, poorly sorted sands and gravels, and the intermixing of angular and well rounded surfaces on the gravel surfaces. A geologic cross section (Figure 2) has been prepared based on the geotechnical evaluation and hot spot evaluation soil borings. Four distinct lithological material types were encountered in the hot spot area as follows:

1) *Disturbed Grey and Brown Clay/Silt*

The upper 5 to 12 feet consisted of grey and brown clay, silt, fine to coarse sand, and gravel. The material ranged from moist to wet and was heavily mottled in areas. The material had a chemical

odor in some areas. Several of the split-spoon samples had evidence of wooden plant debris, which appeared to be relatively recent in age (not of glacial age), suggesting that this zone of material may not be naturally in-place (i.e. disturbed, excavated and re-compacted, etc.). This zone appeared to be excessively thick in the extreme southwestern corner of the concrete pad (borings IW-2 and G-17).

2) Grey Clay and Silt

This material is interbedded with the brown sand and gravel material (discussed below). Generally, this material is dry to damp, rarely wet, and was never saturated when encountered, suggesting that it acts as a relatively impermeable layer. It was often encountered with trace amounts of well rounded to angular, fine to coarse sand and gravel indicative of glacial deposition.

3) Brown Sand and Gravel

This material was interbedded with the grey clay and silt material (discussed above). This material consisted of a brown fine to medium, well rounded to angular sand and gravel. Generally the lenses that were encountered were not continuous and pinched in and out. The lenses were all saturated and appeared to be the migration pathways for the concentrated organics. It should be noted that in many of the borings the sand and gravel layers contained concentrated organics and the grey clay layers above and below the sand and gravel were clean (based on PID readings).

4) Brown Gravel

This material was encountered only in boring IW-3. Based on the borings conducted during the Southern Concrete Pad Geotechnical Survey, this gravel layer was typically encountered at a depth of 15 to 23 feet below the ground surface. It is apparent that this layer is not continuous under portions of the hot spot area since it was not encountered in boring TB-1 (total depth 40 feet). Generally, this gravel layer consists of brown fine to coarse, poorly sorted, well rounded to angular gravel which is saturated. Some fine to coarse sand was also encountered in this material, but the majority of the material was gravel. It is presumed that this is similar to the material that has been referred to as the "lower" or "deep" sand unit in previous reports.

Localized Hydrogeology

It was evident during the hot spot boring program that only the sand and gravel layers were saturated. The clay zones were dry to damp, suggesting that the sand and gravel layers appear as the only water bearing zones, while the clay zones act as confining layers. The most significant hot spots (based on PID measurements) were identified in the saturated sand and gravel zones, suggesting that these units represent the concentrated organics migration pathways.

The two wells that were installed (IW-1 and IW-4) were developed utilizing air sparging equipment (30 to 40 pounds per square inch of pressure) and hand bailing. The wells were left to stabilize for three days after the development process. The water in IW-1 stabilized at 10.0 feet below the ground surface, and IW-4 stabilized at 18.5 feet below the ground surface (see Figure 2). It is apparent that the sand layers drained into IW-1 because the top of the saturated sand lens encountered (screened) in IW-1 was approximately 10 feet below the ground surface. The screened sand layer in IW-4 was first encountered at approximately 18 feet below the ground surface, suggesting that the water level in this well is also a result of drainage from the intercepted saturated sand lens (see Figure 2).

Additional water levels will be recorded to further evaluate hydrogeologic characteristics, however, based on the data available to date, no evidence of artesian conditions have been encountered in the hot spot area. It should also be noted that no water table conditions have been identified to date; only perched water bearing zones were encountered.

Concentrated Organics Distribution

The majority of the concentrated organics material (based on PID measurements presented in Figure 2) in the hot spot area was encountered in the saturated, interbedded sand and gravel layers between 9 and 22 feet below the ground surface.[1] The source of these concentrated organics is not clear, however, the migration of the concentrated organics appears to be confined to the sand and gravel lenses. The sand and gravel units are not continuous, and as a result, the concentrated organics are not wide spread, but rather appear to be confined to the extent of the sand and gravel units. Figure 1 presents the interpreted lateral extent of the hot spots. It should be noted that the southern edge of the hot spots has not been clearly defined.

Based on visual observations and odors, two distinct and likely disconnected hot spots were identified:

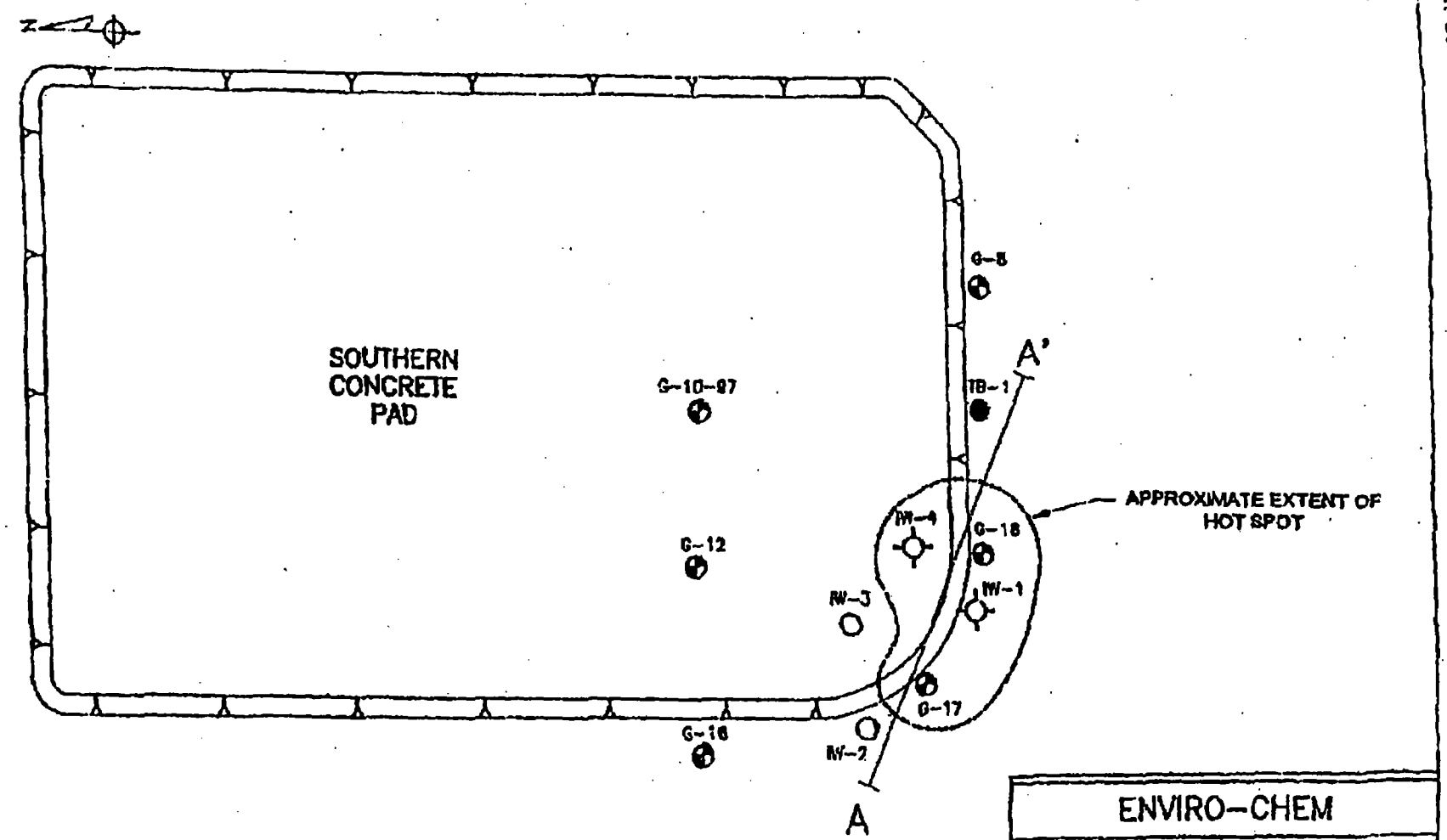
- an upper hot spot located in a possibly interconnected sand and gravel zone between 9 and 16 feet below the ground surface, which had a strong chlorinated solvent odor; and
- a lower hot spot located between 17 and 21 feet below the ground surface, which had a very different odor (semi-volatile type compound) and appearance (brown oily compound).

[1] Concentrated organics were identified in the geotechnical boring G-18 below this depth, however, it is believed that this material may have been dragged down as a result of the drilling methodology that was utilized. The concentrated organics may still exist at the depth identified in G-18 (see Figure 2), and as a result, the well screen in IW-4 was extended to intercept this depth.

The grey clay layers which separate these hot spots appear to be clean (based on PID measurements), suggesting that the concentrated organics have been confined to the sand and gravel layers.

Remedial Program

Injection wells (IW-1 and IW-4) have been installed with screen depths that intercept the hot spot zones. IW-1 has been constructed to treat the upper hot spot (chlorinated solvents), and IW-4 has been constructed to treat the lower hot spot (semi-volatile type compound). Based on development information, the injection wells are well connected to the formation allowing appropriate withdrawal of concentrated organics and subsequent injection of the Fenton reagent. The original calculation identifying the amount of concentrated organics requiring treatment has been significantly reduced based on the extent of the hot spots identified.



NOTE: ONLY GEOTECHNICAL BORINGS IN THE SOUTHWESTERN CORNER ARE SHOWN. ADDITIONAL BORINGS ARE SHOWN IN GEOTECHNICAL REPORT.

LEGEND

- GEOTECHNICAL BORINGS
- HOT SPOT BOREHOLE (NO WELL INSTALLED)
- HOT SPOT BOREHOLE (WELL INSTALLED)
- INITIAL SOIL EXPLORATION BORING

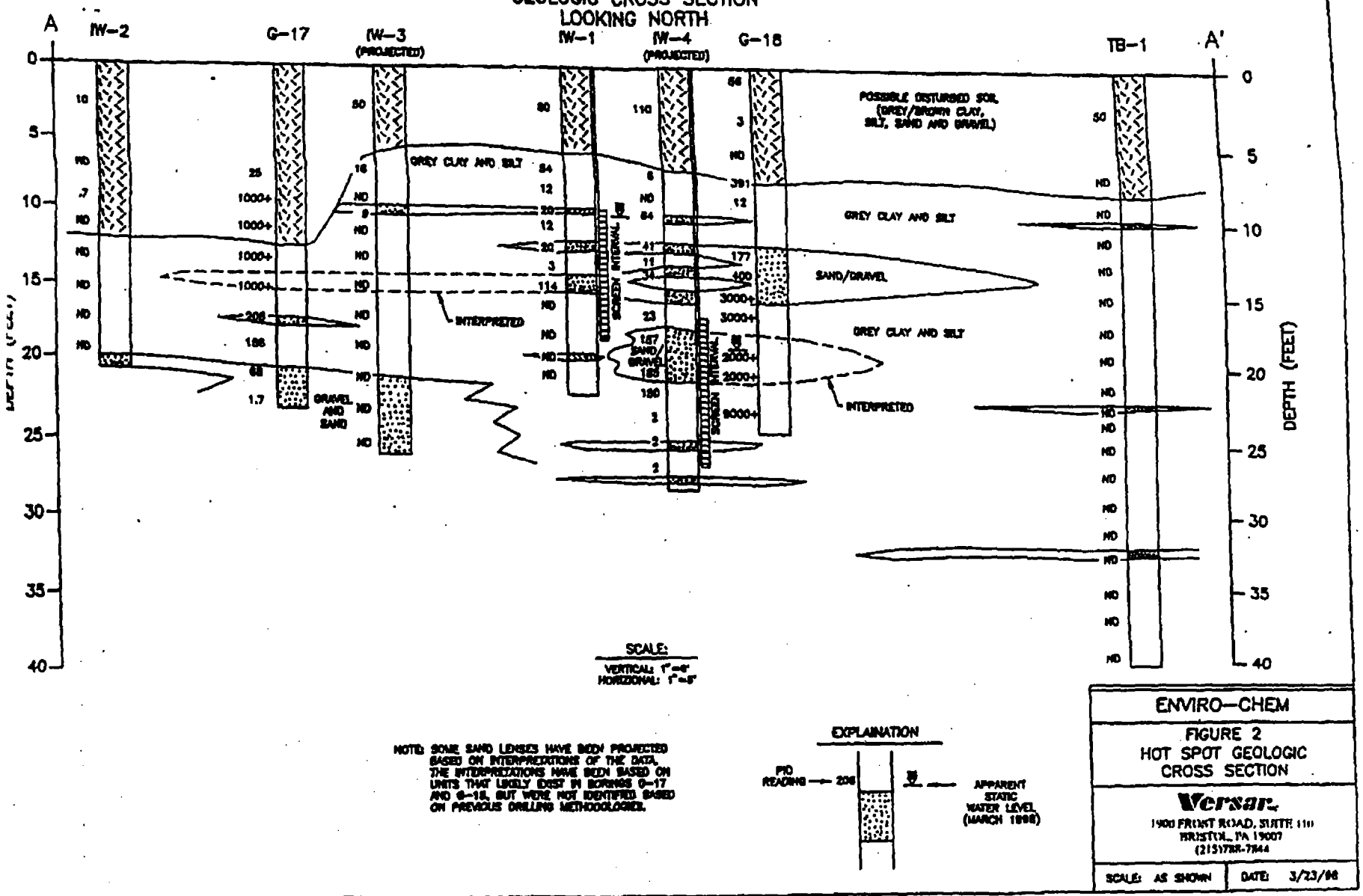
ENVIRO-CHEM

FIGURE 1
HOT SPOT
SITE MAP

Versar, Inc.
1900 FROST ROAD, SUITE 110
BRISTOL, PA 19007
(215)788-7844

SCALE: 1"=30' | DATE: 3/23/98

ENVIRO–CHEM HOT SPOT GEOLOGIC CROSS SECTION LOOKING NORTH



SCALE:
VERTICAL: 1"=4'
HORIZONTAL: 1"=8'

NOTE: SOME SAND LENSES HAVE BEEN PROJECTED BASED ON INTERPRETATIONS OF THE DATA. THE INTERPRETATIONS HAVE BEEN BASED ON UNITS THAT LIKELY EXIST IN BORINGS G–17 AND G–18, BUT WERE NOT IDENTIFIED BASED ON PREVIOUS DRILLING METHODOLOGIES.

EXPLANATION

PID READING — 206

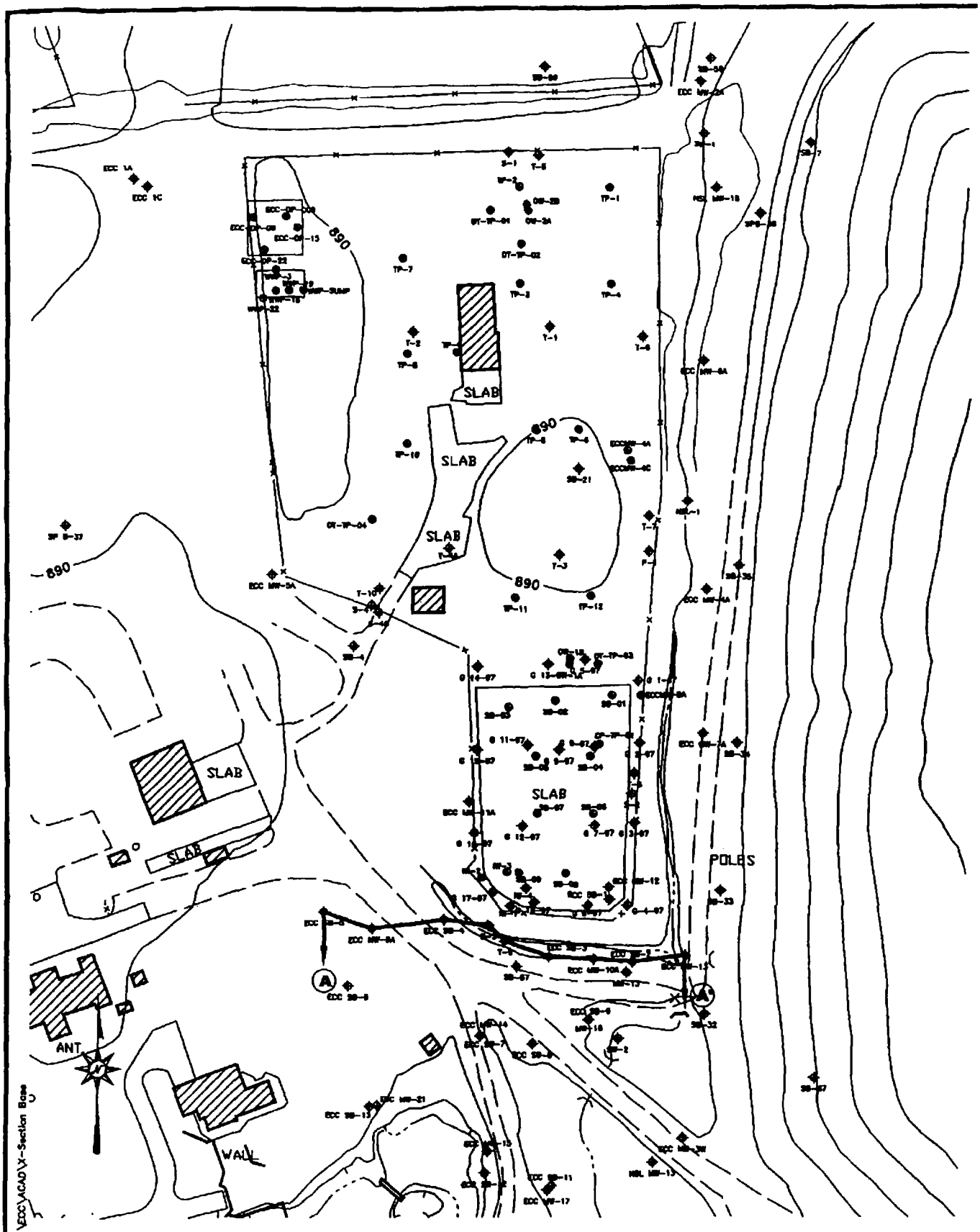
APPARENT STATIC WATER LEVEL (MARCH 1998)

ENVIRO–CHEM

FIGURE 2
HOT SPOT GEOLOGIC CROSS SECTION

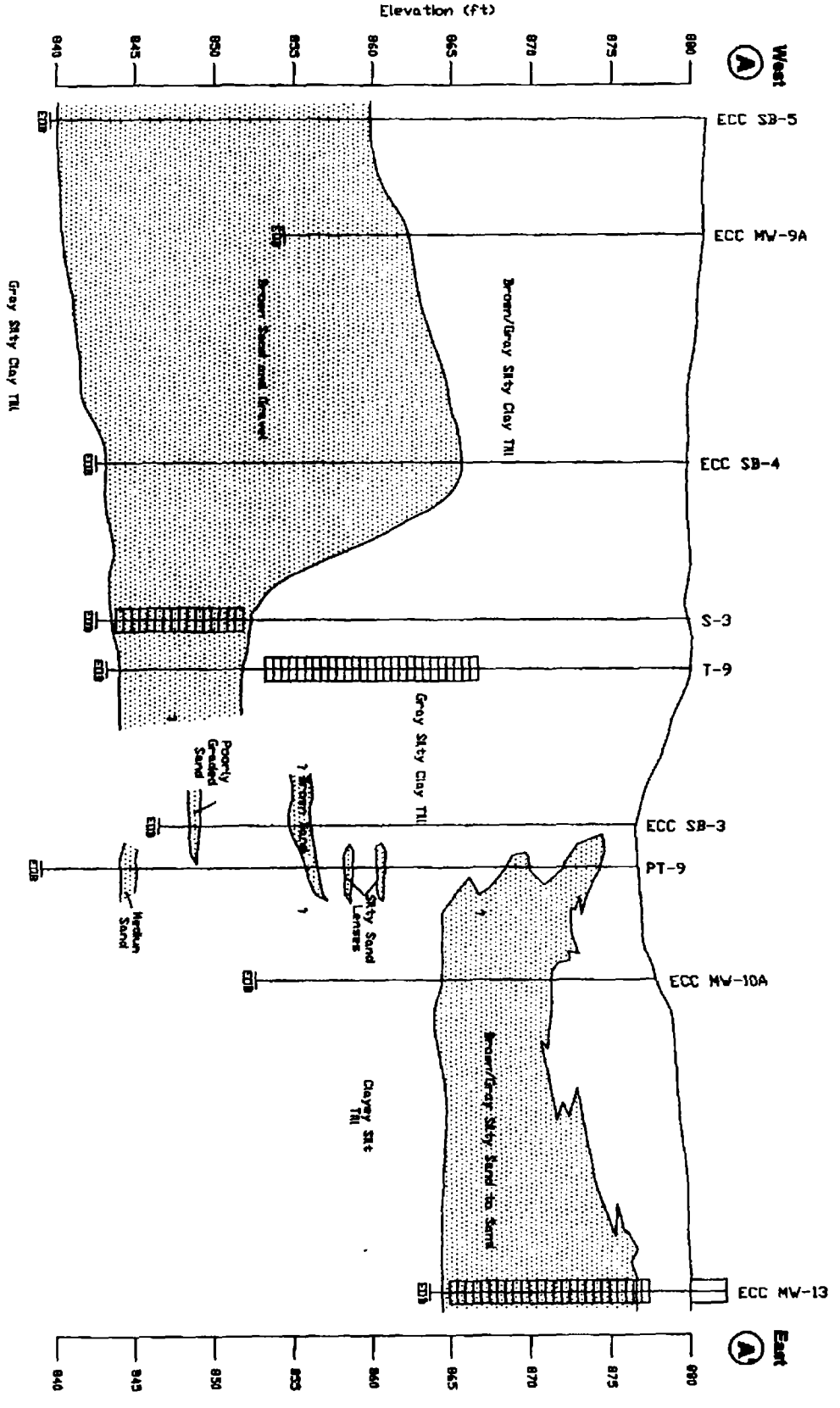
Versar
1900 FRONT ROAD, SUITE 110
BRISTOL, PA 19007
(215)788-7844

SCALE: AS SHOWN | DATE: 3/23/98



ENVIRON	Cross Section Base Map Enviro-Chem Site Zionsville, IN	Figure 2
650 Dundee Road, Suite 150, Northbrook, IL 60062		

Drafter: BJM	Date: 8-4-99	Contract Number: 6585C	Approved:	Revised:


Elevation (ft)
840
845
850
855
860
865
870
875
880
West
East
ECC SB-5
ECC MW-9A
ECC SB-4
S-3
T-9
ECC SB-3
PT-9
ECC MW-10A
ECC MW-13
Gray Silty Clay Till
Brown Sand and Gravel
Brown/Gray Silty Clay Till
Gray Silty Clay Till
Poorly Graded Sand
Brown Silty Sand
Medium Sand
Silty Sand Lenses
Clayey Silt Till
Brown/Gray Silty Sand to Sand